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ABSTRACT

This study examined the risks associated with increased reliance upon technology, including e-mail, instant messages, and cellular phones. Subjects were undergraduate college students ranging in age from 17 to 29. A sample of 40 students was taken from a small liberal arts college in Pennsylvania. A second sample of 25 engineering students was taken from a large university in Illinois. Responses from these samples were merged with a pre-existing data set of 172. The following variables were assessed: cellular phone use, instant messenger use, and interference of cellular phones and instant messenger with work, school, and daily schedules. Another scale assessed attitudes regarding e-mail and perceived convenience of technology. Preferences and actual modes of communication were evaluated through separate ratings of communication patterns in relationships with parents, teachers, close friends, and significant others. Conscientiousness and agreeableness, two dimensions of the Big Five Mini-markers Scale, produced significant results. As hypothesized, differences between extraverts and introverts were found in regard to e-mail and cellular phone communication. College major and sex also produced significant results on communication preferences and behavior. Future research on the harmful effects and possible benefits are needed. (Contains 16 references.) (Author/JDM)

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College Students' Responses to New Communication Technologies

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Abstract

This study examined the risks associated with increased reliance upon technology, including e-mail, instant messages, and cellular phones. Subjects were undergraduate college students ranging in age from 17 to 29. A sample of 40 students was taken from a small liberal arts college in Pennsylvania. A second sample of 25 engineering students was taken from a large university in Illinois. Responses from these samples were merged with a pre-existing data set of 172, taken from Kunderewicz, Michener, and Chambliss (2001). The total number of participants evaluated was 237 (mean age was 19.33 years). General background information was collected on age, sex, college year, and major. The following variables were assessed using a four-point Likert format scale: cellular phone use, instant messenger use, and interference of cellular phones and instant messenger with work, school, and daily schedules. Another four-point Likert format scale assessed attitudes regarding e-mail and perceived convenience of technology. Preferences and actual modes of communication were evaluated through separate ratings of communication patterns in relationships with parents, teachers, close friends, and significant others. To assess personality characteristics, a subscale from the Eysenck Personality Inventory (Eysenck & Eysenck, 1963) and the Big Five Mini-markers Scale (Saucier, 1994) were used. Conscientiousness and agreeableness, two dimensions of the Big Five Mini-markers Scale, produced significant results. As hypothesized, differences between extraverts and introverts were found in regard to email and cellular phone communication. College major and sex also produced significant results on communication preferences and behavior. Future research on the harmful effects and possible benefits are needed.

Introduction

Rapid innovations in communication technology have revolutionized the workplace, transformed personal relationships, and possibly outstripped some individuals' capacity to adjust to change. People can conveniently contact family, friends, and coworkers whether they are inches away or nations apart. Years ago, a message took weeks or more to arrive at its destination, and when it did it was practically old news. Now, in an instant, a message sent via email, cellular phone, or alternate hand held devices can facilitate the spread of family news, business deals or worldly occurrences.

The ease of communication is changing relationships because it affords the opportunity for greater accountability among people. Expectations can be conveyed instantly. As a result, many feel newly pressured by waves of obligations accumulating simultaneously on their various electronic devices. For each hour spent working, and hour's worth of voice mail and email develops, leaving many feeling like Sisyphus, climbing and endless mountain.

Despite its potential drawbacks, the convenience of increased technology cannot be ignored. Email is an easy, private, beneficial, and reliable means of communication, which allows involvement with others at any time or place. Before email, people primarily communicated in three ways, by telephone, conventional mail, or in person. This posed problems for those who were shy, lacked adequate verbal skills, or experienced performance anxiety. With the introduction of email, individuals who possess reasonable writing and typing skills can readily and inexpensively maintain contact with a legion of on-line friends and/or coworkers. Email dramatically increases the potential circle of communication because messages can be continuously forwarded and therefore reach a

the potential circle of communication because messages can be continuously forwarded and therefore reach a broader population. Those who detest face-to-face encounters can excel in a way they would not have been able to ten years ago.

The immediacy of instant messaging poses risks for those who impulsively ventilate their emotions. Users are needing to learn new rules of etiquette and the subtleties of this new communication form, in order to avoid misunderstandings that jeopardize relationships. For those who have trouble expressing their emotions appropriately, email provides an opportunity to learn restraint; individuals can freely express current feelings and choose to save them to be sent later, after possible revision. This exercise can be compared to writing in a diary, where feelings are freely released but can be reexamined and appropriately worded for working out disputes with others (Suler, 1999).

In an atmosphere where communication is key, email eliminates the hassle of scheduling both business and personal meetings, and is also cheaper than monthly phone bills. Ideas, expectations, and emotions have never been so easy to convey so widely; every email user has been given a much expanded voice.

Despite the fact that email provides people with increased communication opportunities, several disadvantages have been observed. Although the anonymity of email may encourage some to be more outgoing and honest, aggressive behaviors and antisocial tendencies have been witnessed in others (Suler, 1999). The lack of social cues normally present in face-to-face communication is absent when using email. During this time lapse, relationship dynamics may be transformed, leaving one to misevaluate situations. As previously discussed, although the potential for cathartic benefits has been

recognized, Schulman (2000) has challenged this notion by suggesting that all too often, enthusiastic writers may vent their immediate feelings and send them promptly to others, without considering the possible consequences.

Results from a national survey of 4,113 adults concerning internet usage showed that those who spend ten or more hours per week on the internet have dramatically decreased personal interaction and telephone communication (Bower, 2000). In the past, society was concerned about the introduction of television as a possible deterrent of personal contact. Statistics suggest that the internet has far surpassed television in inhibiting direct personal encounters. Bower (2000) found that twenty-five percent of adults surveyed spend less time talking to friends and family in favor of internet usage. A possible explanation for the fact that thirty percent of adults are spending less time reading the newspaper could be that the internet offers a competing source of information, including news, weather, and entertainment. Due to the speculation that decreased direct contact with family, friends, and the larger social community leads to isolation, researchers are investigating whether internet usage is a major culprit in social isolation (Bower, 2000).

Consistent with previous findings, the family appears to be most affected by the increase in internet usage. Results taken from a longitudinal study by Krauft, Patterson, Lundmark, Kiesler, Mukopadhayay, & Scherlis (1998) showed that immediate family members who share the same household experienced the reduction in communication following adoption of new electronic technologies. Researchers speculate that a shift in social dynamics is occurring in which familial relationships are being supplanted by impersonal ties among acquaintances. This study also examined the effects of internet

activity on the individual. Despite opportunities to be in contact with a greater number of individuals throughout the day, internet users reported an increased incidence of loneliness and depression. Apparently the internet contact that has replaced family fails to be as psychologically satisfying.

The internet also provides an expanded option for chatting with others, anonymously and developing new relationships at a distance. While some believe that meeting new people over the internet expands conversation among various populations, Dr. Bernardo Carducci fears that diversity may be lost when one is allowed to select similar individuals to converse with, causing a negative shift in social dynamics. This alienation from diversity, referred to as "electronic cleansing" may result in decreased social tolerance; individuals form chat groups based on similar hobbies and beliefs, creating an atmosphere lacking discord. Through the use of chat rooms, people are permitted to create separate social circles and allow only those who fit certain specifications to enter, resulting in increased conformity and therefore decreased diversity (Harris, 2000).

New technology is being embraced in the workplace, as it provides more efficient ways of communicating. Saunders, Tanaka, Kim, Trajico, Twillingham, Brutschy, Wood, and Toms (1999) believed that increased use of newer communication methods result in increased organization and higher rates of worker efficiency. Respondents surveyed reported that slightly more than three-fourths of employers are proponents of technological advances in workplace communication. Although companies rely on new technology to communicate with each other as well as clients, researchers have found that

businesses continue to value face-to-face meetings, telephone conversations and the distribution of hard copy memos (Saunders et. al, 1999).

Wireless communication has altered the role of distance as a function of business. Many businesses have several locations within the United States and overseas. In the past, unless workers were in their offices, the access to worldwide communication was limited; advancements in technology, however, have allowed work to be done around the clock. Location once estranged distant nations from commerce, but local economies are no longer restricted from the global market (*The Economist*, 1999). Advancements in cellular communications have also de-emphasized the importance of location. Technology, not location, controls business and allows individuals to manipulate their world to suit business needs.

The internet certainly enables one with the capability to communicate with others asynchronously, but it may also be narrowing the gap between work and leisure. Are we prepared as human beings who depend on social interaction to not only accept less face-to-face communication but also to give up a significant amount of free time? According to Neff (2000), "The convenience of the internet has allowed business to invade our personal time." The business world has developed new standards for employees including greater accessibility, expanded networking, global communication, constant compilation and familiarity of internet resource information. For an employee to appear competent and conscientious, work is expected to be taken home and completed. Living at a time when most everyone owns a computer places stress on employees to give up their personal time.

Originating in 1979, the cellular industry has grown to service over one billion customers (*The Economist*, 1999). A study conducted by Cingular Wireless Company (2001) revealed that men spend thirty-five percent more time engaged in conversation on cellular phones than women. This information was gathered from Cingular customers in Providence, Rhode Island. Statistics showed that the mean rate of cellular phone duration for males was ninety-seven minutes longer per month than the mean female rate of 275 minutes per month. The majority of men in the workplace could explain the disparity between male and female usage of cellular phones. Traditionally, the more responsibility one has in their job, the more technology is needed at all times. Because of the "glass ceiling" women are less likely to hold positions of authority and therefore are less likely to need cellular phones for business reasons. As a function of the general population, 20.2% of males accumulate over 600 minutes of cellular airtime a month (Cingular Wireless Company, 2001).

Cellular phones have become extremely popular among the teen population. Contradictory to adult cellular phone statistics, teenage girls are more likely to own a cellular phone. According to a study conducted by Teenage Research Unlimited, "Nearly twenty percent of American teens- twenty-four percent of girls, fifteen percent of boys- own a wireless phone," (McDonald, 2000). Benefits of teenage ownership of cellular phones may be that parents have access to their children at all times and teenagers are equipped with the means to contact emergency services if necessary. "About 59 percent of people who get phones for their children cite security and emergency calls as the main reason for purchase" (McDonald, 2001). This is a possible reason why more teenage girls own phones, because parents are often more protective of their female children. On

the down side, school administrators struggle with how to regulate burgeoning number of phones kids bring to school. The market takes advantage of the vulnerable demographic, teenagers, who are often concerned with their appearance and social status (Cahners, 2000). Fashionable accessories are targeting teens that want for the latest trends. "They buy neon covers, even toy kittens that hang off antennas and light up with each ring" (McDonald, 2000). The Associated Press (2001) reported that 54 percent of households in America own at least one cellular phone. Subsequently, families are spending more money on cellular phones and other communication services. Projected spending on these services this year alone is $595.00 per household, an overwhelming increase from $175.00 in 1999.

Some of the hazards of cellular phones are currently being investigated. Speculation has been made about possible links to cancer for steady cellular phone users. Cellular phone usage in inappropriate settings has become a daily annoyance for many. Churches, movie theaters and classrooms were once places where people devoted their time to prayer, entertainment and learning. Now, people disregard the original intent of attending these places while also interrupting the leisure time of others. Cellular companies offer family plans that are extremely appealing to parents for financial reasons. Teenagers are therefore permitted to use their cellular phones without having to worry about budgeting money. With the increased ownership of cellular phones, paid by their parents, and the option for joint credit accounts, adolescents are at a disadvantage. Eliminating responsibility and deferring payments may lead to future financial troubles as these teens enter adulthood.

Nationwide concern is presently over the use a cellular phone while operating a vehicle. EarthVision Cellular likens drivers' distraction while using a cellular phone to drunk driving (2001). With automotive accidents being one of the leading causes of death in the United States, laws are being passed preventing the use of cellular phones while driving. The introduction of a hands free headset is facilitating conversation on the cellular phone while driving. This may reduce some of the risk of accidents; however, no dialing device can be designed to reduce the amount of concentration one uses while conversing.

This study examined the risks associated with increased reliance upon technology, including email, instant messages and cellular phones. Sex differences and college major differences were expected on dimensions of email use, the introduction of new technology, and preferences for communication. Five main personality characteristics, agreeableness, conscientiousness, emotional stability, intellect and extraversion were expected to produce varying results in regard to frequency of engaging in technologically advanced forms of communication.

Methods

Subjects were undergraduate college students ranging in age from seventeen to twenty-nine. A sample of forty students was taken from a small, private liberal arts college in Eastern Pennsylvania. A second sample of twenty-five engineering students was taken from a large university in Illinois. A pre-existing data set of 172 subjects taken from Kunderewicz, Michener, and Chambliss (2001) was also used for a majority of items. The mean age of participants was 19.33. The total number of participants was 237.

Multiple factors were assessed using a survey composed of several sections. General background information was collected on age, sex, college year, and major. The following variables were assessed using a four-point Likert format scale (4=strongly agree to 1=strongly disagree): cellular phone use, instant messenger use, and interference of cellular phones and instant messenger with work, school, and daily schedules. Another four-point Likert format scale (4=always to 1=never) assessed attitudes regarding email. Preferences and actual modes of communication were evaluated using a rating system. Dimensions for the rating scale regarding communication with parents, significant other, close friends, and teachers were: email, voice mail, telephone, in person, and letter. To assess extraversion, the 22-item Extraversion Subscale from the Eysenck Personality Inventory (Eysenck & Eysenck, 1963) was used. For a broader perspective on personality, the Big Five Mini-markers Scale (Saucier, 1994) assessed five distinguishing personality characteristics: extraversion, agreeableness, conscientiousness, intellect, and emotional stability.

Results

A median split was used to create low and high groups on the conscientious factor of the Big Five Mini-markers Scale. Subjects who scored higher on the conscientiousness factor reported feeling greater stress in relation to work and greater personal stress (low conscientiousness: $x= 2.76$, $s.d.= .64$, $n= 29$ versus high conscientiousness: $x= 3.06$, $s.d.= .54$, $n= 35$; $t= 2.03$, $df= 62$, $p< .05$).

Agreeableness, another factor from the Big Five Mini-markers Scale, was examined using a median split. Methods of communication, such as email, voice mail,

letters, telephone, and in person, between subjects and their parents, close friends and significant others produced significant results. Subjects who scored high on agreeableness were more likely to communicate with their parents via email (low agreeableness: x= 1.45, s.d.= .51, n= 31 versus high agreeableness: x= 1.71, s.d.= .46, n= 34; t= 2.11, df= 63, p< .04). These subjects were also more apt to communicate with their parents via voice mail (low agreeableness: x= 1.00, s.d.= .00, n= 31 versus high agreeableness: x= 1.24, s.d.= .43, n= 34; t= 3.04, df= 63, p<.003). In regards to communication through writing letters, subjects scoring higher in agreeableness were more likely to write letters to their close friends (low agreeableness: x= 1.00, s.d.= .00, n= 31 versus high agreeableness: x= 1.24, s.d.= .43, n= 34; t= 3.04, df= 63, p<.003) and significant others (low agreeableness: x= 1.03, s.d.= .19, n= 29 versus high agreeableness: x= 1.21, s.d.= .42, n= 33; t= 2.12, df= 60, p< .04). In addition to methods of communication, other variables produced significant results. Students who scored high on agreeableness reported checking their email more often (low agreeableness: x= 4.74, s.d.= 1.15, n= 31 versus high agreeableness: x= 5.26, s.d.= .96, n= 34; t= 1.99, df= 63, p< .05). Similarly, students who scored high on agreeableness were more likely to reply to all messages received via email (low agreeableness: x= 2.58, s.d.= .72, n= 31 versus high agreeableness: x= 2.94, s.d.= .60, n= 34; t= 2.20, df= 63, p< .03).

The other three dimensions of the Big five Mini-markers Scale, emotional stability, intellectance, and extraversion produced no statistically significant results. Even though the Big Five Mini-markers Scale did not produce significant results for the extraversion factor, a second extroversion scale, The Eysenck Personality Inventory (Eysenck &

Eysenck, 1963) suggests differences between introverts and extraverts. These two scales were significantly correlated ($r= .50$, $p< .01$). A median split was used to create low and high extraversion groups based on the Eysenck Personality Inventory. Subjects who scored high on extraversion reported communicating through email more often (low extraversion: $x= 4.70$, $s.d.= 1.38$, $n= 27$ versus high extraversion: $x= 5.31$, $s.d.= .68$, $n= 35$; $t= 2.29$, $df= 60$, $p< .03$). Similarly, subjects who scored high on extraversion indicated that they replied more frequently to email messages (low extraversion: $x= 2.96$, $s.d.= .52$, $n= 27$ versus high extraversion: $x= 2.63$, $s.d.= .77$, $n= 35$; $t= 1.94$, $df= 60$, $p< .05$). Another technologically advanced form of communication, owning a cellular phone, was examined, and students who scored high on extraversion were found to be more likely to own a cellular phone. Of the respondents who owned a cellular phone, 71.4% scored high on extraversion while only 28.6% scored high on introversion.

Subjects who scored high on the extraversion scale were more likely to communicate with their significant other through email than introverts (low extraversion: $x= 1.37$, $s.d.= .49$, $n= 27$ versus high extraversion: $x= 1.67$, $s.d.= .48$, $n= 33$; $t= 2.36$, $df= 58$, $p< .03$). Extraverts were more likely to write letters to their parents than introverts (low extraversion: $x= 1.00$, $s.d.= .00$, $n= 27$ versus high extraversion: $x= 1.14$, $s.d.= .36$, $n= 35$; $t= 2.09$, $df= 60$, $p< .04$). Those who scored high on the extraversion scale indicated that they talked to their parents in person more frequently than those who scored low on the extraversion scale (low extraversion: $x= 1.33$, $s.d.= .48$, $n= 27$ versus high extraversion: $x= 1.68$, $s.d.= .47$, $n= 35$; $t= 2.90$, $df= 60$, $p< .005$). In addition, extraverts reported their preference for talking to their parents in person more so than

introverts (low extraversion: x= 1.63, s.d.= .49, n= 27 versus high extraversion: x= 1.86, s.d.= .36, n= 35; t= 2.12, df= 60, p< .04).

Subjects were also grouped according to whether they were liberal arts students or engineering students; some significant difference emerged. The majority of engineering majors (65.4%) were male. More liberal arts than engineering students use instant messenger as a form of communication (liberal arts majors: x= 1.88, s.d.= .33, n= 41 versus engineering majors: x= 1.46, s.d.= .51, n= 26; t= 3.71, df= 38.53, p< .001). Subjects who were engineering majors reported feeling more positive about learning to use new software (liberal arts majors: x= 2.68, s.d.= .80, n= 40 versus engineering majors: x= 3.00, s.d.= .49, n= 26; t= 2.05, df= 63.86, p< .05). Engineering majors reported responding more quickly to email messages than liberal arts students (liberal arts majors: x= 2.63, s.d.= .49, n= 41 versus engineering majors: x= 2.85, s.d.= .37, n= 26; t= 2.02, df= 62.92, p< .05).

Significant sex differences were found on two dimensions of the Big Five Mini-markers Scale; conscientiousness and agreeableness. More females (64.7%) than males (35.3%) scored high on the agreeableness factor. Likewise, more females (66.7%) than males (33.3%) scored high on the conscientiousness factor. Examination of actual modes of communication revealed that more females email their close friends than males do (62% versus 38%). Similarly, 88.9% of females communicate with close friends through the use of letters compared with only 11.1% of males. Preferences for communication with close friends showed that more females prefer communicating via email and phone as compared to males. Of the subjects who indicated a preference for communicating with friends by way of letter, one hundred percent were female.

Actual communication with significant others produced different responses in males and females. Female subjects reported communicating with significant others through letters more so than males (females 87.5%, males 12.5%). Voice mail also produced noticeable results; eighty percent of females reported using voice mail as a form of communication while only twenty percent of males reported use of voice mail.

Discussion

Personality factors played a significant role in subjects' responses to new communication technology. Those who were more conscientious experienced greater stress in relation to work and their personal lives. This finding supports the concept that those who are concerned with their performance tend to be more affected by environmental stressors. Subjects who scored high on the agreeableness factor, suggesting they are cooperative and open to others, checked their email more often. These same individuals were more likely to reply to email messages, possibly due to their eagerness to please others.

As expected, highly agreeable individuals communicated more with parents through email and voice mail. These additional ways of communicating show interest beyond the normal methods of communicating with parents. This is possibly an attempt to show their concern and interest in continued communication with their parents. For college students who understand their parents' empty nest syndrome, maintaining contact with parents is both sympathetic and kind, which are two measures on the agreeableness factor. Similarly, these individuals were interested in pleasing close and friends and significant others. Many people feel that communicating through letters is a very

personal way of expressing feelings, such as the warmth that characterizes agreeable people. Statistical significance was found supporting the notion that subjects who scored high on agreeableness were more interested in sending close friends and significant others personal mail.

The hypothesis that differences exist between extraverts and introverts was supported by the Eysenck measure of extraversion. Extraverts tend to be outgoing and expressive characters who thrive on interpersonal contact. These social individuals not only communicated through email more often, but also replied more frequently to email messages. The need to be constantly available to others may explain the finding that extraverts are more likely to own a cellular phone. Introverts may feel overwhelmed by the invasion of their personal space and time and therefore not invest in a cellular phone or spend time checking and replying to an abundance of emails.

Extraverts and introverts answered questions based on their actual modes of communication with parents, close friends and significant others. Not surprisingly, extraverts communicated more with their significant other through email than introverts. This supports the previous finding that introverts are less likely than extraverts to communicate via email. Extraverts, as compared to introverts, reported writing more letters to their parents. A possible reason for this is that extraverts, who are burdened by time alone, find alternate ways of communicating with others even when others are not present. Introverts may use their time more privately and resort to reading, writing in a journal or just relaxing. Spending time in person with parents appeared to be a more frequent occurrence for extraverts. This is typical of extravert behavior because the need for human interaction is greater than that for introverts. This behavior was consistent

with their preference for communicating with their parents. Extraverts wanted to see more of their parents and participate in face-to-face communication.

This data suggests that there were significant differences in the communication behavior of liberal arts students versus engineering majors. Even though the findings did not suggest that a majority of engineering majors were introverts, engineers are generally mathematical and technically inclined, as their major demands. Liberal art students encompass a wide variety of majors, thus having more diversity, for example, a more equal number of males and females. Not only were engineering majors predominantly male, but their technical skills gave them more confidence in learning to use new software. Engineering majors tend to have characteristics such as precision, accuracy and efficiency. This coupled with their fearlessness toward technology and the instantaneous nature of email may explain why email is a more appealing method of communication. One finding suggests that liberal arts majors spend more time on instant messenger than engineering majors. Engineering majors may find this type of communication laborious because it is not always timely and reliable.

The expectation that males and females would differ on dimensions of personality and preferences for communication was supported. As gender role traits suggest, females tend to be more agreeable. Possibly innate maternal instincts and social pressures contribute to why females would score higher on measures of warmth and kindness. In general, males have been regarded as a more conscientious sex (Marusic & Bratko, 1998), however findings from this study suggest the opposite. A possible reason for females scoring higher on the conscientious factor is that in a college setting if females do not exhibit efficiency, organization and practicality, they will have difficulty competing

with their male counterparts. Females may also consider themselves more conscientious because they feel the need to measure up to high academic standards, thus rating themselves higher than males would rate themselves.

College females reported contacting close friends through email and letters more so than males. Because females scored higher on agreeableness, they may be more inclined to please their friends. Receiving letters is a sure way of proving dedication, due to the personal and time-consuming nature of letter writing. Email was not only an actual mode of communication for females, but also a preferred way of communicating with close friends. When asked to rate their preferred way of communicating with friends, females also identified using the telephone as important. While email messages to close friends may serve as a way of providing each other with personal updates, it does not provide what a telephone does in the way of hearing the inflection and intonation that depicts emotion. When talking with their close friends on the telephone, females appreciated a more personal approach to communicating, which may be a necessary component of maintaining a close friendship.

Female findings on communication with significant others are in agreement with findings on close friends. Females wrote more letters than males and were more apt to use voice mail. Instead of resorting to email, females, possibly in an attempt to maintain the personal nature associated with telephone conversation, often decide to leave a voice message. The fact that individuals have different communication mode preferences creates new challenges in the workplace and at home. Some leave email on all day, others check their voice mail compulsively. Remembering the idiosyncratic

communication style of one's colleague or partner has become important to those wishing to make optimal use of new communication options.

Future research on the harmful effects and possible benefits of new communication technology is needed to foster the best possible balance of efficient communication and optimal use of free time. As with all change, these innovations offer both threats and opportunities, and challenge us to continue to develop wiser ways of relating to others.

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